

CLAIMS

1. A method of attaching a locator stud on a panel, said locator stud including a shank portion and a flange portion adjacent one end of said locator stud having a diameter greater than said shank portion and a generally radial annular bearing surface between said flange portion and said shank portion, said method
5 comprising the following steps:

forming an opening in said panel having a diameter greater than said flange portion of said locator stud;

inserting said flange portion of said locator stud in said panel opening;

10 driving a plunger toward said panel including an opening receiving said shank portion, a first annular die surface surrounding said opening of said plunger coaxially aligned with said annular bearing surface, deforming said annular bearing surface radially outwardly against said panel, and a second projecting annular die surface surrounding said first annular die surface against said panel, deforming
15 said panel radially inwardly against an outer concave surface of said flange portion, locking said flange portion in said opening of said panel.

2. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said flange portion of said locator stud includes a radial rim portion adjacent an end of said flange portion, said method including driving said second
20 annular die surface of said plunger against said panel, deforming said panel radially inwardly against radial rim portion, forming a substantially flush installation of said flange portion of said locator stud in said panel.

3. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said annular bearing surface of said flange portion of said locator stud is concave and said first annular die surface of said plunger is convex, said method including driving said concave surface of said first annular die surface against
5 said concave surface of said annular bearing surface, deforming said concave surface radially outwardly and forming said outer concave surface of said flange portion overlying a surface of said panel at said panel opening.

4. The method of attaching a locator stud on a panel as defined in Claim 3, wherein said flange portion of said locator stud includes a radial rim portion
10 adjacent an end of said flange portion, wherein said method includes driving said second projecting annular die surface of said plunger against said panel, deforming said panel radially inwardly against said radial rim portion.

5. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said flange portion of said locator stud includes a concave generally
15 conical end face having a major diameter adjacent an outer surface of said flange portion, said method including driving said concave generally conical end face of said flange portion against a die member, deforming said outer surface of said concave generally conical end face radially outwardly, thereby forming said outer concave surface of said flange portion.

20 6. The method of attaching a locator stud on a panel as defined in Claim 5, wherein said die member includes an annular die surface having a diameter greater than said flange portion, said annular die surface of said die member deforming said panel radially inwardly against said outer concave surface of said flange portion.

7. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said die member includes a projecting annular die surface having a diameter greater than said flange portion and said second projecting annular die surface of said plunger has a diameter generally equal to said projecting annular die surface of said die member and coaxially aligned therewith, wherein said method includes driving said plunger toward said panel, driving said second projecting annular die surface of said plunger against said panel and said panel against said coaxially aligned projecting annular die surface of said die member, thereby deforming coaxially aligned annular depressions into opposed sides of said panel surrounding said flange portion of said locator stud.

8. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said outer surface of said flange portion is generally cylindrical prior to installation of said locator stud in said panel, and said method including deforming said outer surface of said flange portion into said outer concave surface receiving said panel.

9. The method of attaching a locator stud on a panel as defined in Claim 8, wherein said flange portion includes a radial rim portion adjacent an end of said flange portion and said outer concave surface of said flange portion is formed by said second projecting annular die surface and said radial rim portion.

10. The method of attaching a locator stud on a panel as defined in Claim 1, wherein said flange portion includes a radial rim portion adjacent an end of said flange portion and said outer surface of said flange portion includes a frustoconical outer surface extending from adjacent said radial rim portion radially outwardly having a minor diameter adjacent said radial rim portion, said method including deforming said panel radially inwardly between said radial rim portion and said frustoconical outer surface.

11. A method of attaching a locator stud on a panel, said locator stud including a generally cylindrical shank portion and a flange portion integral with and coaxially aligned with said shank portion having a diameter greater than said shank portion and a radial rim portion adjacent one end of said shank portion, and a generally radial annular bearing surface between said shank portion and said flange portion, said method comprising the following steps:

forming an opening in said panel having a diameter generally greater than said flange portion of said locator stud;

inserting said flange portion of said locator stud in said panel opening;

driving a plunger toward said panel including an opening receiving said shank portion of said locator stud, a first annular die surface surrounding said opening of said plunger coaxially aligned with said generally radial annular bearing surface, deforming said annular bearing surface radially outwardly against said panel, and a second projecting annular die surface surrounding said first annular die surface against said panel surrounding said flange portion, deforming said panel radially inwardly around said radial rim portion and against an outer concave surface of said flange portion, locking said flange portion in said opening in said panel.

12. The method of attaching a locator stud on a panel as defined in Claim 11, wherein said generally radial annular bearing surface of said flange portion of said locator stud is concave and said first projecting annular die surface of said plunger is convex, said method including driving said convex surface of said first projecting annular surface against said concave surface of said annular bearing surface, deforming said concave surface radially outwardly overlying a surface of said panel at said panel opening.

13. The method of attaching a locator stud on a panel as defined in Claim 11, wherein said flange portion includes a frustoconical outer surface adjacent said radial rim portion having a minor diameter adjacent said radial rim portion, said method including deforming said panel radially inwardly against said frustoconical outer surface of said flange portion and between said radial rim portion and said frustoconical outer surface.

14. A locator stud and panel assembly, comprising: a locator stud including a generally cylindrical shank portion and a radial flange portion integral and coaxially aligned with said shank portion having a concave outer surface and a panel having a thickness generally equal to an axial length of said flange portion of said locator stud having an opening therethrough receiving said flange portion of said locator stud including a convex inner surface deformed into said concave outer surface of said flange portion with said flange portion generally flush in said panel and said shank portion projecting from said panel perpendicular to said panel.

15. The locator stud and panel assembly as defined in Claim 14, wherein said flange portion of said locator stud includes a radial rim portion adjacent an end of said flange portion and said panel is deformed into and around said radial rim portion.

16. The locator stud and panel assembly as defined in Claim 14, wherein said panel includes a V-shaped annular depression in one surface of said panel surrounding said flange portion.

17. The locator stud and panel assembly as defined in Claim 14, wherein
5 said panel includes coaxially aligned V-shaped annular depressions formed into opposed surfaces of said panel.

18. The locator stud and panel assembly as defined in Claim 14, wherein said concave outer surface of said flange portion is generally arcuate including an arcuate midportion and projecting end portions, and said convex surface of said panel
10 is arcuate conforming in shape to said arcuate concave outer surface of said flange portion.

19. The locator stud and panel assembly as defined in Claim 14, wherein said concave outer surface of said flange portion is formed by a radial rim portion adjacent an end of said flange portion and a frustoconical surface adjacent said radial
15 rim portion having a minor diameter adjacent said radial rim portion.

20. A locator stud, comprising: a generally cylindrical shank portion, a radial flange portion having a diameter greater than said shank portion integral and coaxially aligned with said shank portion having a concave annular surface adjacent said shank portion, a generally cylindrical outer surface and a radial rim portion
20 adjacent an end of said flange portion.

21. A locator stud, comprising: a generally cylindrical shank portion and a flange portion having a diameter greater than said shank portion integral and coaxially aligned with said shank portion including a concave frustoconical end surface and a concave annular bearing face between said shank portion and said
25 flange portion.

22. The locator stud as defined in Claim 21, wherein said flange portion includes a concave annular outer surface.

23. The locator stud as defined in Claim 21, wherein said flange portion includes a cylindrical outer surface.

5 24. A locator stud, comprising: a generally cylindrical shank portion, a radial flange portion having a diameter greater than said shank portion integral and coaxially aligned with said shank portion having a radial rim portion adjacent an end of said flange portion, said flange portion including a frustoconical outer surface adjacent said radial rim portion having a minor diameter adjacent said radial rim
10 portion and a generally radial annular surface surrounding said shank portion.